PATENT SPECIFICATION

1,072,626

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Cages for Cylindrical Rollers in Roller Bearings

WE, WILHELM SCHAEFFLER and GEORG SCHAEFFLER, both of German nationality, and both of 3 am Sportplatz Weihersbach, Herzogenaurach, near Nürnberg, Germany, trading as Industriewerk Schaeffler oHG do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

The present invention relates to a cage for cylindrical rollers in a roller bearing of the type comprising two annular rims connected to one another by bars which bound slots for accommodating the rollers and guide the rollers in axially-parallel manner and retain them in both radial directions. The invention also relates to a method of making such cages.

Many constructional forms of cages of the type referred to above are already known. Basically, there is a distinction between two types of cage, namely so called massive cages and sheet metal cages, the massive cages having a wall thickness which comes close to the roller diameter, whilst the so-called sheet metal cages have a much smaller wall thickness. Both types of cage have advantages and disadvantages with the result that each type has only a limited field of use.

In the case of massive cages, the production of the slots for accommodating the rollers by punching is sometimes made difficult if the diameter of the rollers and thus the wall thickness of the cage exceeds a certain amount. With these massive cages, the retaining of the rollers in both radial directions in itself always presents a special problem. Retaining the rollers in this way requires subsequent forming-on of retaining-projections by plastic deformation on the cage bars, these projections projecting into the slots and thus preventing the rollers falling out inwardly or outwardly. The production of such retaining projections always involves additional working operations and in many cases there is also a risk that the retaining projections will be damaged or even broken off completely when the rollers are being introduced into the cage slots.

In the case of massive cages, use also has already been made of an advantage as far as the retaining of the rollers is concerned which results from the production of such cages by rolling-round from a flat strip. If the roller slots are first made in the flat strip and the strip thus pre-treated is then rolled round, in the rolling operation the neighbouring surfaces of the cage bars become inclined in such a manner at an acute angle relatively to one another that their edges in the bore of the cage are spaced from one another at a distance which is less than the roller diameter, thus retaining the rollers in the radial inward direction. In this case, however, it is still necessary to form-on retaining projections additionally in a separate working operation in order to retain the rollers externally in a radial sense.

In the case of the sheet metal cages which have been referred to above, the cage bars are generally given a M-shape or W-shape in longitudinal sectional view for the purpose of guiding and retaing the rollers. These cages also have disadvantages which have hitherto prevented them being generally used successfully in practical work. For example, such cages generally have such small guide surfaces for the rollers that a high rate of wear has to be expected In addition, owing to the small metal thickness of such cages, the cages are not in themselves of very good shape-retaining

[Price 4s. 6d.]

properties, so that even before mounting and certainly also during operation deformation may result whereby the satisfactory retaining and/or axially-parallel guiding of the rollers may be prejudiced.

In contrast, the present invention consists in a cage for cylindrical rollers in a roller bearing, comprising two annular rims connected to one another by bars which bound slots for accommodating the rollers and guide the rollers in axially-parallel manner and retain them in both radial directions, the cage being characterised in that the bars comprise portions of differing radial thickness over their length, these portions being at different distances from the cage axis, the thickest bar portions extending radially within the pitch circle of the rollers or projecting outwardly beyond the pitch circle to only a slight extent, the slot-bounding surfaces of the thickest bar portions being inclined at an acute angle to one another so that the edges of these bar portions in the inside of the cage are spaced from one another across each slot at a distance which is less than the roller diameter and the thinnest bar portions being disposed exclusively radially-outwardly of the pitch circle of the rollers and their radially-innermost slot-bounding edges being spaced from one another across each slot at a distance which is less than roller diameter.

These features show that a cage according to the present invention is a synthesis of the known massive cage and the sheet metal cage. The cage bars have portions of different radial thickness over their length i.e., they are of relatively considerable thickness similar to that used in massive cages over a certain length, namely in the regions where the rollers are to be retained in the inward direction. In these bar portions, the axially-parallel guiding of the rollers will generally also be effected. At the remaining bar portions, which are to be used for retaining the rollers in the radial outward direction, the bars are on the other hand to be of relatively slight thickness, such as is used in the case of sheet metal cages. The rollers are retained in the inward direction in a manner known *per se*, in that the slot-bounding surfaces of the relatively thick bar portions are inclined at an acute angle to one another in such a manner that their edges in the bore of the cage are spaced from one another at a distance which is less than the roller diameter. On the other hand, the rollers are retained in the radial outward direction by the relatively thin bar portions which extend exclusively radially outside the pitch circle and the slot-bounding edges of which are to be spaced at a distance from one another which is less than the roller diameter. Since these relatively thin bar portions are outwardly offset, the rollers in such a cage may be inserted into the cage slots by snapping them in, the relatively thin bar portions bounding the slots yielding laterally in a resilient manner.

The advantages of such a cage reside more particularly in that no additional retaining noses have to be formed-on in special working operations in order to retain the rollers. The rollers are retained inwardly, as already stated, simply by the inclined setting of the bar surfaces, whilst the rollers are retained externally by punching the thin-walled bar portions to a relatively considerable width, the boundary edges of the bars being spaced from one another at distances which are less than the roller diameter. In addition, there is the further advantage that in such a cage guide zones of adequate length are made available for the guiding of the rollers along the boundary surfaces at the relatively thick-walled bar portions, so that in these regions only very slight wear is to be expected. Finally, such a cage, owing to the partially thick-walled construction, also has substantially greater shape-retaining properties than known sheet metal cages, thus considerably widening the possibilities of using such cages.

A further advantage of the invention is that it provides a method of manufacturing a cage in which slots for accommodating rollers are punched in a flat rectilinear sheet-metal strip which is of such a cross-section that at both longitudinal edges it has a thickness amounting to approximately half the roller diameter, and in the region situated between the edges at one side it has a groove-like recess of such dimension that there is a thickness of material of about 1/4 of the roller diameter, the slots being punched transversely to the longitudinal direction of the strip and being slightly wider than the roller diameter in their end-regions where the sheet metal strip has a greater thickness of material whereas the slots are narrower than the roller diameter in their central region where the sheet metal strip has a smaller thickness of material, the central region of the sheet metal strip with a thickness of material of about 1/4 of the roller diameter being brought into an offset position in the direction opposite to the groove-like recess, before or after the punching of the slots, so as to result in a total cage thickness amounting to approximately 3/4 of the roller diameter, and the sheet metal strip being bent to a semi-cylindrical or cylindrically-shaped cage, the offset central bar portions of which are situated on the outer periphery of the cage.

Thus, this method of manufacturing provides a cage wherein the rollers are retained internally by the *per se* known narrowing of

FIG.1

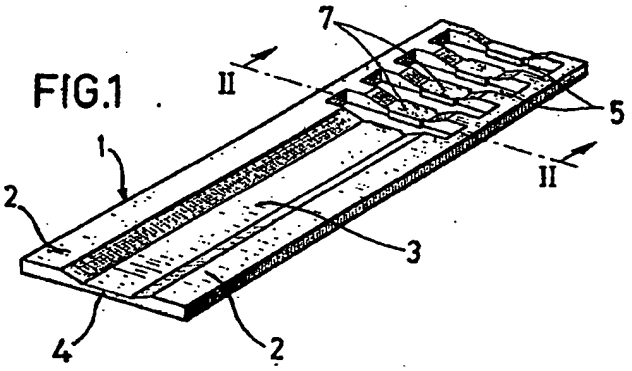


FIG.2

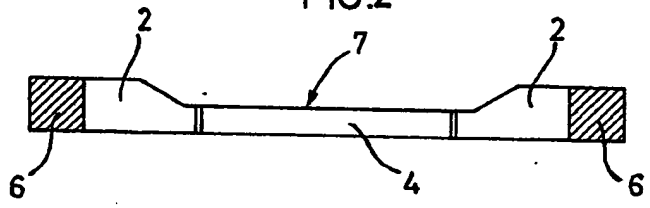
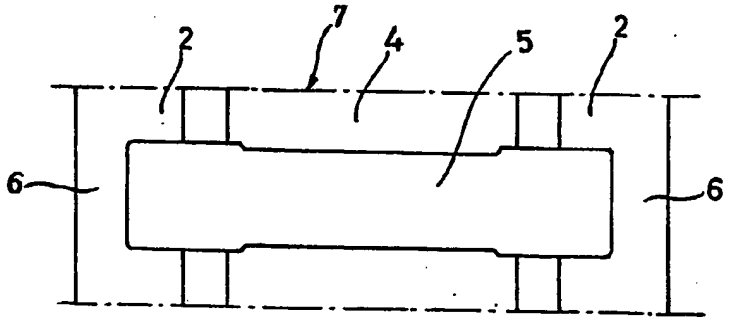


FIG.3



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2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

FIG.1

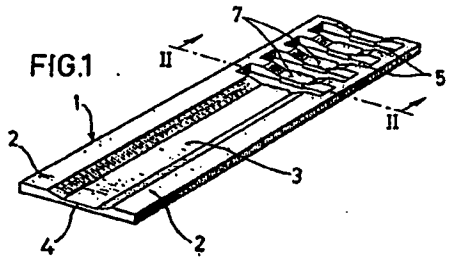


FIG.2

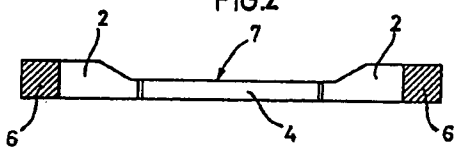


FIG.3

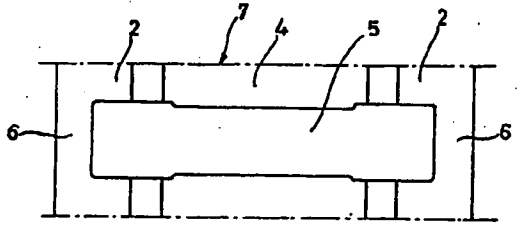


FIG.4

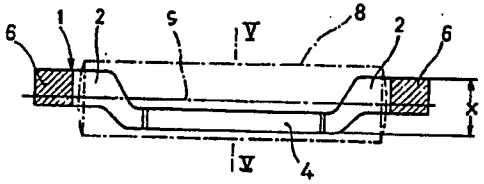
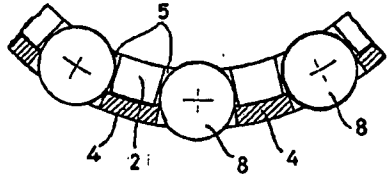


FIG.5



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SHEETS 1 & 2

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FIG.4

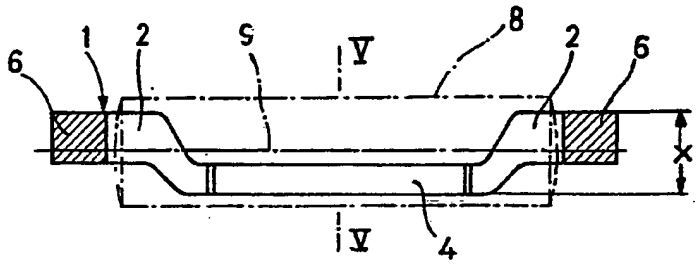

FIG.5